

A Comparative Study: Knowledge Regarding Anemia and Its Prevention among Anemic and Non-Anemic Antenatal Mothers

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Abstract

Background: Anemia during pregnancy is an important maternal health problem and is associated with adverse maternal and fetal outcomes. Adequate knowledge regarding the causes, signs and symptoms, complications, prevention and management of anemia is essential for antenatal mothers to adopt appropriate preventive measures. Therefore, assessment of anemia status and knowledge regarding anemia and its prevention is important for promoting maternal and fetal health.

Aim: The present study was conducted with the objectives of assessing the prevalence of anemia among antenatal mothers at Capital Hospital, Bhubaneswar, and comparing the knowledge regarding anemia and its prevention among anemic and non-anemic antenatal mothers.

Methods: A quantitative research approach with a descriptive, hospital-based cross-sectional comparative design was adopted. The study was conducted at Capital Hospital, Bhubaneswar, Odisha. A total of 80 antenatal mothers were included in the study. Data were collected using a structured questionnaire consisting of socio-demographic variables and questions assessing knowledge regarding the definition, causes, risk factors, signs and symptoms, investigations, complications, treatment and prevention of anemia. Hemoglobin status was considered for classification of mothers as anemic or non-anemic. The collected data were analyzed using descriptive and inferential statistics. The conceptual framework of the study was based on the P.A. Kinser and D.E. Lyon Model.

Results: The study also demonstrated statistically significant associations between knowledge/outcome and selected variables, including occupational status ($\chi^2 = 12.65$, $df = 2$, $p = 0.005$), monthly family income ($\chi^2 = 9.88$, $df = 3$, $p = 0.019$), gestational age ($\chi^2 = 7.54$, $df = 2$, $p = 0.023$), and birth spacing ($\chi^2 = 10.22$, $df = 3$, $p = 0.017$). Age, educational status, type of family, dietary pattern, parity and number of abortions were not statistically significant.

Conclusion: The study highlights that anemia remains an important concern among antenatal mothers and that knowledge regarding anemia and its prevention needs continued reinforcement. Although many mothers demonstrated awareness of important aspects of anemia, gaps were identified in understanding several preventive and clinical aspects. Regular antenatal counselling, individualized nutrition education, promotion of iron-folic acid supplementation, early identification of anemia, and continuous health education by nurses and other healthcare professionals are recommended to improve knowledge and support effective prevention and management of anemia during pregnancy.

Keywords: Anemia, Antenatal mothers, Prevalence, Knowledge, Prevention, Hemoglobin, Pregnancy, Iron deficiency, Antenatal care, Nutrition

Introduction

Anemia is a significant global health concern, affecting nearly one-third of the world's population in various forms. During pregnancy, it is especially problematic in developing countries, where it contributes to numerous adverse maternal and fetal outcomes. The World Health Organization (WHO) considers anemia in pregnancy to be a public health issue when its prevalence is 5% or more in population studies, and classifies prevalence rates of 40% or higher as a severe public health problem. Globally, about 56% of pregnant women in low- and middle-income countries (LMICs) are affected by anemia, making it particularly common in this group^[1].

Anaemia during pregnancy is reported to have negative maternal and child health effect and increase the risk of

maternal and perinatal mortality. The negative health effects for the mother include fatigue, poor work capacity, impaired immune function, increased risk of cardiac diseases, and mortality. Some studies have shown that anaemia during pregnancy contributes to 23% of indirect causes of maternal deaths in developing countries^[2].

Anaemia occurs when the number of red blood cells, and therefore their ability to carry oxygen, becomes inadequate to meet the body's physiological demands. These oxygen needs differ based on factors such as age, sex, altitude of residence, smoking habits, and the different stages of pregnancy. Although iron deficiency is the most common cause of anaemia worldwide, other factors such as deficiencies in folate, vitamin B12, and vitamin A, as well as acute or chronic inflammation, parasitic infections, and

inherited or acquired conditions affecting hemoglobin production, red blood cell formation, or their lifespan, can also lead to anaemia^[3].

Iron is an essential component of hemoglobin, the oxygen-carrying pigment in the blood. Iron is normally obtained through the food and by recycling iron from old red blood cells and in the absence of the required iron blood concentrations, blood cannot carry oxygen effectively and hence normal functioning of every cell in the body will be affected. It is estimated that a median amount of 840-1210 mg of iron needs to be absorbed over the course of the pregnancy. Approximately 90% of cases of anemia in pregnancy are of the iron deficiency type. Globally, anemia affects 1.62 billion people (24.8%), among which 56 million (41.8%) are pregnant women. It is a major public health problem particularly among poorer segments of the population in developing countries where 95% of the world anemic pregnant women are residing^[4].

A study on "Knowledge attitude and practice of pregnant women in correlation with Anemia" was conducted in India. It revealed that the lower the knowledge about Anemia in pregnant women increase the 'risk five times' and the worst practice about prevention of Anemia in pregnant women increased anemia 'risk six times'. So the potential risk factors that indicated to increase Anemia were Knowledge and Practice about Anemia in pregnant mothers^[5].

According to EDHS 2011 report, among women with a live birth in the five years preceding the survey, only 34 percent took iron tablets during their last pregnancy. Although reports exist about what is being done and what should be done globally and locally to address maternal anemia prevention and treatment, maternal mortality and anemia prevalence around the world including Ethiopia continues to remain high. Therefore it is helpful for all stakeholders that involves in this area i.e. patient care givers, health care providers, health institution and policy maker^[6].

In many developing countries, anemia remains a major concern due to its strong link with poor pregnancy outcomes, including higher rates of maternal and perinatal deaths, preterm birth, low birth weight, reduced APGAR scores, impaired fetal physical and cognitive development, and increased infant mortality. Additionally, anemia can exacerbate complications from postpartum hemorrhage and increase susceptibility to puerperal infections—both of which are significant causes of maternal death in these regions. A study was done by Daka et al., 2018 to assess pregnant women's knowledge and practice about anemia prevention in government hospitals in Ethiopia. According to the findings, among 286 pregnant women, only 57.3 percent and 50 percent of them had adequate understanding and bad practice, respectively, when it came to preventing anemia during pregnancy^[7].

In developing countries like India, rapid industrial growth has increased exposure to airborne irritants such as silica

dust, cotton fibers, chemical vapors, and industrial pollutants. Workers employed in manufacturing units, textile industries, construction sites, and chemical factories are particularly vulnerable to occupational asthma^[8].

A descriptive study was carried out by Aboud et al., 2019 to evaluate knowledge, attitude and practice regarding the prevention of anemia among pregnant women attending primary health centres in the Tabuk region, the results show that 40 percent of the respondents had a poor practice score regarding the prevention of anemia. According to Ademuyiwa et al., 2020 in a study of awareness and prevention of anemia among pregnant women attending antenatal clinic at a University Teaching Hospital in Nigeria Iyabo, the results show that among 182 respondents, 73.8 percent had a good overall practice of prevention of anemia in pregnancy^[9, 10].

A study of knowledge and practice of mothers regarding the prevention of anemia during pregnancy, in a teaching hospital, Kathmandu, Ghimire, & Pandey., (2013) found that only 48.7 percent of mothers have adequate knowledge and 34 percent of study participants have good practice regarding prevention of anemia during pregnancy. Next, from the study by (Appiah et al., 2020) that was conducted to assess the knowledge and adherence to anemia prevention strategies among pregnant women attending antenatal care facilities in Juaboso District in Western-North Region, Ghana, among 598 participants, only 39.1 percent of the pregnant women were fully adhering to anemia prevention strategies^[11].

Anaemia is a significant public health concern and remains one of the most common nutritional disorders globally. It is particularly widespread among women of reproductive age, especially during pregnancy. In developing countries, the major causes of anaemia include inadequate iron intake and absorption, malaria, hookworm infestation, diarrheal diseases, HIV/AIDS and other infections, genetic conditions such as sickle cell disease and thalassemia, blood loss during childbirth, heavy menstrual bleeding, and closely spaced pregnancies^[12].

Nurses play a vital role in the prevention and control of anemia among antenatal mothers. Through antenatal assessment, health education, nutritional counselling, monitoring of hemoglobin levels, reinforcement of iron-folic acid supplementation, and promotion of healthy practices, nurses can contribute significantly to reducing the burden of maternal anemia.

Therefore, assessing the prevalence of anemia and comparing knowledge regarding anemia and its prevention among anemic and non-anemic antenatal mothers is important. The findings of such a study can help identify gaps in knowledge and provide a basis for strengthening antenatal health education and preventive strategies aimed at improving maternal and fetal health.

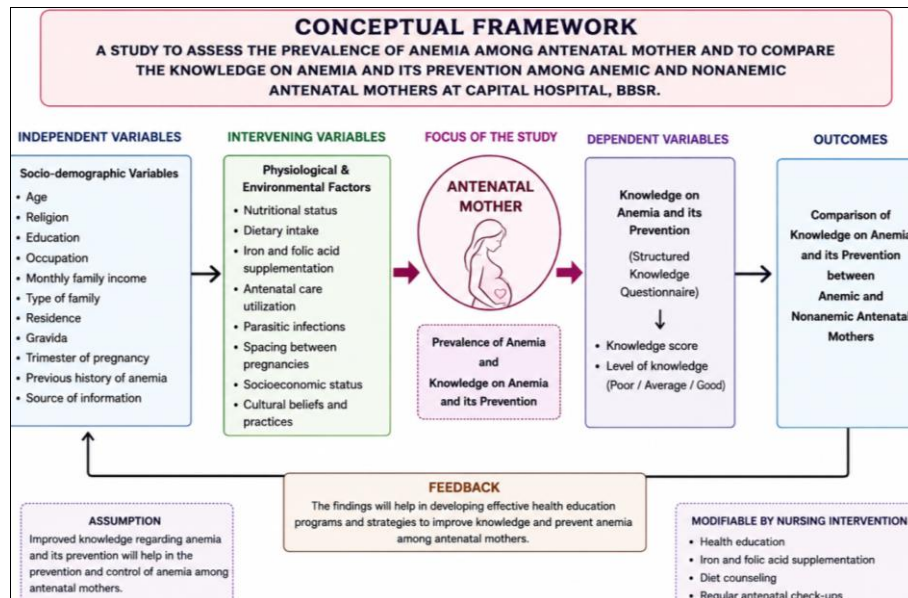


Fig 1: P.A. Kinser and D.E. Lyon Conceptual Model

The conceptual framework illustrates the relationship between the independent variables, intervening variables, focus of the study, dependent variables, and outcomes. The socio-demographic variables such as age, education, occupation, income, and previous history of anemia are considered independent variables. Physiological and environmental factors, including nutritional status, dietary intake, iron-folic acid supplementation, antenatal care utilization, and spacing between pregnancies, act as intervening variables. The focus of the study is antenatal mothers, among whom the prevalence of anemia and knowledge regarding anemia and its prevention are assessed. Knowledge is measured using a structured questionnaire and categorized as poor, average, or good. The major outcome is the comparison of knowledge between anemic and non-anemic antenatal mothers. The framework also provides feedback for developing effective health education and prevention strategies, with nursing interventions such as health education, diet counselling, iron-folic acid supplementation, and regular antenatal check-ups.

Materials and Methods

Research Design and Setting

The study adopted a quantitative research approach with a descriptive research design. The design was selected to assess the prevalence of anemia and to compare the knowledge regarding anemia and its prevention among anemic and non-anemic antenatal mothers. A total of 80 antenatal mothers were included in the study. Data were collected using socio-demographic variables and a self-structured knowledge questionnaire, and the data were analyzed using descriptive and inferential statistics.

Design Representation

Quantitative Research Approach → Descriptive Research Design → 80 Antenatal Mothers → Capital Hospital, Bhubaneswar → Data Collection → Statistical Analysis → Findings and Conclusion.

The study was conducted at Capital Hospital, Bhubaneswar, Odisha. The setting was selected based on accessibility of the participants, feasibility and practicability of conducting

the study, familiarity with the setting, ease of assessment, and availability of administrative permission and cooperation. The participants were antenatal mothers attending the antenatal services of the selected hospital.

Population, Sample and Sampling Technique

The population of the study consisted of antenatal mothers attending the antenatal services of Capital Hospital, Bhubaneswar, Odisha, who fulfilled the inclusion criteria during the study period. The sample consisted of 80 antenatal mothers selected from the accessible population. The sample size was determined using Yamane's formula. A systematic random sampling technique was used to select the 80 antenatal mothers from the daily list/register of antenatal attendees during the study period.

Sample Size

The sample consisted of 80 antenatal mothers attending the antenatal services of Capital Hospital, Bhubaneswar, Odisha who met the inclusion criteria. The sample size was determined using Yamane's formula.

According to Yamene's formula

$$n = N / (1 + N e^2)$$

Here n = Sample size, N = Population size, e = Percentage of error i.e. 0.05

Inclusion Criteria

- Pregnant women (any trimester) attending antenatal ward in the selected hospital during the study period.
- Age ≥ 18 years (or include minors if you have parental consent; specify local ethics requirements).
- Willing to provide informed written consent and participate.

Exclusion Criteria

- Critically ill women requiring immediate referral/emergency care.
- Women who decline consent.
- Women with known hemoglobinopathies (e.g., thalassemia major) if these would confound prevalence interpretation — specify whether to exclude or analyze separately.

- Women who have received blood transfusion within last 1 month (Hb measurement may be confounded).

Variables

Dependent variable

Anaemia status (yes/no) — measured by haemoglobin (g/dL). (WHO cutoffs: pregnant women Hb < 11.0 g/dL = anaemia; mild 10.0–10.9, moderate 7.0–9.9, severe <7.0 g/dL).

Knowledge score on anaemia and prevention (continuous score; can be categorized: poor / fair / good).

Independent variables

Socio-demographics: age, education, occupation, family income, religion, residence (urban/rural)

Obstetric: parity, gravidity, gestational age (trimester), inter-pregnancy interval

Nutrition & behaviour: dietary intake (iron-rich foods), tea/coffee intake, pica, vegetarian status

Supplementation & health-care: iron/folic acid (IFA) use, compliance, deworming status, ANC visits

Medical history: prior anaemia, chronic illness, malaria, helminthic infection

Anthropometric: weight, height (BMI)

Laboratory: haemoglobin value, any peripheral smear/MCV if available

Tool for Data Collection

Data were collected using a structured tool consisting of two sections.

Tool I: Socio-Demographic Performance

Tool I was used to collect the socio-demographic information of the antenatal mothers. It consisted of 10 items, including variables such as age, religion, educational status, occupation, monthly family income, type of family, dietary pattern, gestational age, parity, birth spacing and history of abortion as represented in the study tables. The information was collected through the interview method.

Tool II: Structured Knowledge Questionnaire

Clinical/research measurements and review of antenatal records were used to assess the anemia status of the antenatal mothers. The hemoglobin (Hb) value in g/dL was obtained from the hospital laboratory or recorded from the relevant clinical record. Additional information such as weight, height, gestational age, previous Hb results, previous supplementation and relevant medical history was obtained through clinical measurement and ANC records.

Scoring and Interpretation

The knowledge questionnaire was used to classify the mothers according to their knowledge regarding anemia and its prevention. The study assessed knowledge in domains including causes, symptoms, complications, investigations, preventive measures and management. The thesis also reports that the tool was subjected to reliability testing using the test-retest method, with reliability calculated by Karl Pearson's correlation coefficient, yielding a reliability coefficient of 0.70, which was considered acceptable.

Validity and Reliability

The data collection tool was developed by the investigator based on the objectives of the study and the review of literature. The self-structured knowledge questionnaire on

anemia and its prevention was submitted to experts for assessment of its content validity. The experts reviewed the items for relevance, clarity, appropriateness, and adequacy of coverage of the study objectives. Necessary modifications were made according to the experts' suggestions, and the final tool was used for data collection. The thesis includes a criteria checklist for validation of the tool, list of experts for content validation, and certification for validation in the annexures.

The reliability of the tool was assessed using the test-retest method on 20 samples. The reliability coefficient was calculated using Karl Pearson's correlation coefficient. The obtained reliability coefficient was $r = 0.70$, which was considered acceptable and indicated that the tool had satisfactory reliability for assessing the required information.

Data Collection Procedure

The data collection procedure was carried out systematically in the following steps:

Step 1 Obtaining permission:

The investigator obtained the necessary permission from the concerned authorities of Capital Hospital, Bhubaneswar, before commencing the study.

Step 2 Ethical considerations:

Ethical approval was obtained from the appropriate Institutional Ethics Committee/Review Board, and the rights, privacy and confidentiality of the participants were maintained.

Step 3 Selection of participants:

Eligible antenatal mothers attending the antenatal ward/ANC services were identified according to the inclusion and exclusion criteria. A total of 80 antenatal mothers were selected for the study.

Step 4 Obtaining informed consent:

The investigator explained the purpose, procedure and importance of the study to each participant. Written informed consent was obtained from those who agreed to participate.

Step 5 Collection of socio-demographic data:

The investigator collected the participants' socio-demographic information using Tool I, through the interview method.

Step 6 Assessment of knowledge:

Tool II, the self-structured knowledge questionnaire, was administered to assess knowledge regarding anemia and its prevention. The questionnaire contained 25 items covering definition, causes, symptoms, investigations, complications, prevention and management of anemia.

Step 7 Assessment of hemoglobin status:

The participants' hemoglobin (Hb) values were obtained from hospital laboratory investigations/clinical records to determine their anemia status.

Step 8 Review of antenatal records:

Relevant information such as gestational age, previous Hb values, supplementation and medical history was obtained from the ANC records wherever available.

Step 9 Checking the completed tools:
After completion, the investigator checked each questionnaire and record for completeness and accuracy. Data quality was maintained through daily checking and supervision.

Step 10 Data organization:

The collected information was coded, tabulated and organized systematically for statistical analysis and interpretation. The study used descriptive and inferential statistics for analysis.

Step 11 Counselling/referral:

Participants with severe anemia or other concerning findings were informed and referred to the treating healthcare team for appropriate care according to hospital practice.

Ethical Considerations

Obtain approval from Institutional Ethics Committee / Institutional Review Board (IEC/IRB) before starting. Obtain informed written consent (or thumbprint if illiterate with witness). Consent must explain purpose, procedures,

benefits, risks, confidentiality, voluntary participation, and right to withdraw. Confidentiality: anonymize data (use study IDs), store consent forms separately from data, restrict access. Minimize harm: do not withhold standard care; ensure participants with anaemia receive or are referred for standard treatment per hospital protocol. Data security: password-protected database; store hard copies in locked cabinet. If participants are pregnant minors, follow local regulations for parental/guardian consent and assent. Dissemination: present aggregated results only; no individual identity disclosure.

Data Analysis

Data was carried out using SPSS version 21. Descriptive statistics: frequency, percentage, mean, Standard deviation. Inferential: Paired t-test was used to compare pre-test and post-test knowledge scores. Chi-square test was used to determine the association between post-test knowledge scores and selected demographic variables. A p-value less than 0.05 were considered statistically significant.

Results

Table 1: Frequency (f) and percentage (%) distribution of socio demographic variables. (N= 80)

Sociodemographic variables	Frequency (n)	Percentage (%)
Age in years		
a. 20- 24 years	30	37.5
b. 25- 29 years	28	35
c. 30- 34 years	15	18.75
d. Above 35 years	7	8.75
Educational status of mother		
a. Illiterate	12	15
b. Secondary	28	35
c. Higher Secondary	25	31.25
d. Degree	15	18.75
Types of family		
a. Nuclear family	42	52.5
b. Joint family	28	35
c. Extended family	10	12.5
Occupational status of mother		
a. Unemployment	30	37.5
b. Daily Wages	22	27.5
c. Government employee	10	12.5
d. Private employee	18	22.5
Monthly income of the family		
a. Rs. 5000- 6000	20	25
b. Rs. 6001- 8000	25	31.25
c. 8001- 10000	18	22.5
d. Above 10,000	17	21.25
Diet Pattern		
a. Vegetarian	30	37.5
b. Non- Vegetarian	50	62.5
Gestational ages of the mother		
a. 1-12 weeks	18	22.5
b. 13- 27 weeks	40	50
c. 28- 32 weeks	22	27.5
Number of parity		
a. 1 st time	35	43.75
b. 2 nd time	30	37.5
c. 3 rd time	15	18.75
Birth spacing		
a. Less than 18 months	15	18.75
b. 18- 35 months	30	37.5
c. More than 36 months	20	25
d. First generation	15	18.75
Number of abortion		
a. Zero	60	75

b. One	15	18.75
c. Two	5	6.25

Table – 1 reveals that the demographic characteristics.

Table 2: Frequency and percentage distribution to assess knowledge regarding Anemia among antenatal mothers. (N= 80)

Sl. No	Knowledge regarding anemia	Frequency (f)	Percentage (%)
1.	What is anemia a. Poor nutrition b. Iron deficiency c. Low hemoglobin d. None of the above	10 18 45 7	12.5 22.5 56.25 8.75
2.	Anemia is which type of disease a) Communicable b) Non communicable c) Worm infestation d) Non of the above	5 55 12 8	6.25 68.75 15 10
3.	Normal Hb status during pregnancy a. 7-9.9gm% b. 10-10.9gm% c. 11-12 gm% d. >11gm%	26 24 18 12	32.5 30 22.5 15
4.	Cause of anemia a) Poor nutrition b) Bleeding during pregnancy c) Multiple pregnancy & spacing d) All listed above	8 10 12 50	10 12.5 15 62.5
5.	What are the main causes of anemia a. Contaminated food and water cause anemia b. Blood loss due to menstruation c. Infections d. Vomiting and diarrhoea	10 33 22 18	12.5 41.25 27.5 22.5
6.	Who is at high risk of being an anemic a) Male Adolescent b) Pregnant women c) Disabled patients d) Diabetics	3 60 10 7	3.75 75 12.5 8.75
7.	Common symptom of anemia a. shortness of breathing b. Exceptional fatigue c. General body weakness d. Poor appetite & Dizziness or fainting	18 24 20 18	22.5 30 25 22.5
8.	How would you identify an anemic person a. She appears pale b. She suffers from seizure c. Red face with flushing d. Bluish discoloration of extremities	45 10 12 13	56.25 12.5 15 16.25
9.	Perception of Anemia a. Natural state of pregnancy b. Increased Body weight c. Problem related to blood d. Increase in Blood sugar	13 5 52 10	16.25 6.25 65 12.5
10.	What should the minimum Hb level be in a pregnant woman? a. Correct response b. Wrong response c. Not answered d. Don't know	50 15 10 5	62.5 18.75 12.5 6.25
11.	Which lab investigation used commonly to detect anemia during pregnancy? a. Blood smear b. LFT c. PFT d. CBC	10 5 15 60	12.5 6.25 18.75 75
12.	What is the consequence of anemia during delivery? a. Death of baby b. Difficulty in delivery c. Post-partum haemorrhage d. Don't know	20 10 30 20	25 12.5 37.5 25

13.	Complications during pregnancy due to anemia		
	a. Intrauterine death	12	15
	b. Pre-eclampsia	28	35
	c. IUGR	30	37.5
	d. No complication	10	12.5
14.	Do you know drinking tea, coffee&milk can reduce iron absorption in the body?		
	a. Tea	15	18.75
	b. Coffee	20	25
	c. Milk	20	25
	d. All of the above	25	31.25

The study revealed that most respondents correctly identified anemia as low hemoglobin (56.25%) and a non-communicable condition (68.75%). Nearly half recognized the 7-9.9gm Hb range (32.5%), and the majority attributed anemia to multiple factors (62.5%) & causes of anemia due to blood loss (41.25%) , with pregnant women seen as the highest-risk group (75%). Fatigue (30%) & paleness

(56.25%)were common symptoms identified. most respondents(16.25%) know anemia is a natural state of pregnancy. Most participants knew the minimum required Hb level (62.5%), CBC as the main test (75%), and postpartum hemorrhage (37.5%) and IUGR (37.5%) as key complications. Many knew that tea, coffee, and milk reduce iron absorption (31.25%).

Table 3: Frequency and percentage distribution to assess knowledge regarding Anemia prevention among antenatal mothers. (N= 80)

Sl. No	Prevention regarding anemia	Frequency (f)	Percentage (%)
1.	How can we prevent anemia?		
	a. By good nutrition	10	12.5
	b. Using Iron supplement	5	6.25
	c. Drinking or Eating fruits	7	8.75
	d. All listed above	58	72.5
2.	Which one is best spacing of child to prevent anemia?		
	a. 1year	20	25
	b. <2 years	5	6.25
	c. ≥ 2Years	35	43.75
	d. I don't know	20	25
3.	Minimum antenatal visit as per MCH is:		
	a. 2	10	12.5
	b. 3	12	15
	c. 4	50	62.5
	d. 5	8	10
4.	Antenatal mother should avoid		
	a. IFA tablet	8	10
	b. Coconut water	12	15
	c. Therapeutic supplements	8	10
	d. Smoke cigarette & Drinks alcohol	50	62.5
5.	What should be done during pregnancy to prevent anemia?		
	a) Take antimalarial & deworming drugs	5	6.25
	b) Should not skip meals	12	15
	c) Eat breakfast regularly	50	62.5
	d) All listed above	13	16.25
6.	Which vitamin helps to absorb iron		
	a) Vitamin A	8	10
	b) Vitamin B	5	6.25
	c) Vitamin C	60	75
	d) Vitamin D	7	8.75
7.	Which is high source of iron		
	a) Spinach	40	50
	b) Rice	20	25
	c) Orange	8	10
	d) None of the above	12	15
8.	What is the appropriate way to treat anemia		
	a) Multi vitamin supplements	5	6.25
	b) Iron supplements	55	68.75
	c) Eat more foods with calcium	10	12.5
	d) Exercise more	10	12.5
9.	Antenatal mother should be counselled to take		
	a) Take routine antenatal drugs regularly	55	68.75
	b) antimalarial drugs	12	15
	c) Deworming tablets	10	12.5
	d) All of the above	3	3.75
10.	Which is very necessary to prevent anemia during pregnancy		
	a) Regular visit to Anganwadi	5	6.25
		60	75

	b) Regular antenatal check up and take prescribed drugs	10	12.5
	c) Regular doctor consultation	5	6.25
	d) None of the above		
11.	Source of information on anemia and its prevention	25	31.25
	a. Treating physician	30	37.5
	b. Anganwadi/ASHA worker	15	18.75
	c. Internet/social media	10	12.5
	d. Friends/family		

Prevention involved good nutrition, iron supplements and Eating fruits (72.5%). Most respondent(43.75%) knew about Proper spacing (≥ 2 years), four ANC visits(32.5%), and avoiding smoking/alcohol(62.5%) were widely recognized. Vitamin C as a helper in iron absorption (75%), spinach as a rich iron source (50%), and iron supplements as the best treatment (68.75%) were correctly identified. Most mothers emphasized to take regular antenatal drugs(68.75%) & regular ANC care (75%) and cited ASHA/Anganwadi workers (37.5%) as their main information source.

Table 4: Chi square analysis showing the association between levels of knowledge with selected socio demographic variables. (N= 80)

Socio demographic characteristics	Df	Chi square	p value
Age(in yrs)	3	4.82	0.184
Educational status of mother	3	6.95	0.073
Types of family	2	3.12	0.210
Occupational status of mother	2	12.65	0.005*
Monthly income of the family	3	9.88	0.019
Diet Pattern	1	0.92	0.337
Gestational ages of the mother	2	7.54	0.023
Number of parity	2	5.21	0.074
Birth spacing	3	10.22	0.017
Number of abortion	2	2.5	0.294

$p \leq 0.05$ * (Statistically significant)

The chi-square analysis showed significant associations with occupation ($\chi^2=12.65$, $p=0.005$), family income ($\chi^2=9.88$, $p=0.019$), gestational age ($\chi^2=7.54$, $p=0.023$), and birth spacing ($\chi^2=10.22$, $p=0.017$). No significant association was found with age, education, family type, diet pattern, parity, or number of abortions ($p>0.05$).

Discussion

The present study was conducted among 80 antenatal mothers at Capital Hospital, Bhubaneswar, with the objectives of assessing the prevalence of anemia and comparing knowledge regarding anemia and its prevention among anemic and non-anemic antenatal mothers. The discussion of the findings is presented in relation to socio-demographic characteristics, prevalence of anemia, knowledge regarding anemia and its prevention, and association with selected socio-demographic variables.

In the present study, among the 80 antenatal mothers, the majority belonged to the 25–29 years age group, followed by 20–24 years. Most mothers had secondary or higher-secondary education, and the majority belonged to nuclear families. A considerable proportion were unemployed, while others were daily wage workers or employed in government/private sectors. Most mothers belonged to families with a monthly income of ₹6,001–8,000 and followed a non-vegetarian dietary pattern. More than half were in the second trimester of pregnancy.

These findings are comparable with the study by Noronha et al. (2023) conducted among antenatal mothers in selected hospitals of Chhattisgarh. Their study also examined anemia among antenatal mothers and reported significant associations of knowledge with education, occupation and monthly family income. This supports the present study finding that socio-economic and educational characteristics can influence maternal awareness and health-related outcomes^[13].

The present study assessed the prevalence of anemia among 80 antenatal mothers based on their hemoglobin status. The findings indicate that anemia remains an important concern among pregnant women attending antenatal services. This finding is consistent with Acheampong et al. (2019), who conducted a cross-sectional study among 200 pregnant women in Ghana and reported an anemia prevalence of 51%, with most cases being mild or moderate^[14].

Similarly, Noronha et al. (2023) reported that 61.5% of antenatal mothers were anemic in their study conducted in Chhattisgarh. The similarity suggests that anemia continues to be a substantial maternal health problem in hospital-based antenatal populations^[15].

In contrast, Melku and Addis (2014) reported a lower prevalence of 16.6% among 302 pregnant women attending antenatal care at Gondar University Hospital. Differences in prevalence may be related to differences in geographical location, nutritional status, socio-economic conditions, antenatal care utilization, dietary practices, and study populations^[16].

The present study found that antenatal mothers had partial knowledge regarding anemia and its prevention. Although many mothers were aware of the definition, common symptoms and investigations of anemia, gaps were observed regarding normal hemoglobin levels, dietary practices, complications and appropriate preventive measures. The study therefore indicates a need for continuous antenatal education and reinforcement of preventive practices.

The findings are supported by Ekwere and Ekanem, who reported that pregnant women demonstrated relatively good awareness of anemia, but several participants continued to practice food restrictions that could negatively affect nutritional intake. The authors emphasized the importance of continuous nutrition education^[17].

Similarly, a study cited in the thesis by Daka et al. (2018) found that only 57.3% of pregnant women had adequate knowledge regarding prevention of anemia, indicating that knowledge gaps remain an important concern among pregnant women^[18].

In the present study, significant associations were observed between the outcome variable and occupational status ($\chi^2 = 12.65$, $p = 0.005$), monthly family income ($\chi^2 = 9.88$, $p = 0.019$), gestational age ($\chi^2 = 7.54$, $p = 0.023$), and birth spacing ($\chi^2 = 10.22$, $p = 0.017$). However, age, educational status, type of family, dietary pattern, parity and number of abortions did not show statistically significant associations.

These findings are consistent with evidence reported in the reviewed literature. The systematic review and meta-analysis by Geta et al. (2022) found that short birth intervals, inadequate antenatal care, low dietary diversity and lack of iron-folic acid supplementation were associated with increased risk of anemia. The study also identified education and socio-economic factors as important determinants^[19].

Overall, the present findings and previous studies emphasize that anemia prevention requires more than iron supplementation alone. Regular antenatal screening, appropriate nutrition, adequate birth spacing, adherence to iron-folic acid supplementation and repeated health education are important components of comprehensive maternal care.

Implications of the Study

The findings of the present study have important implications for nursing practice, nursing education, nursing administration and nursing research. In nursing practice, nurses can play an important role in early identification of anemia, assessment of hemoglobin status, antenatal counselling, promotion of iron-folic acid supplementation, balanced diet and appropriate birth spacing. In nursing education, the findings emphasize the need to strengthen students' knowledge and skills regarding prevention, early detection and management of anemia so that they can provide effective health education to antenatal mothers. In nursing administration, adequate educational materials, counselling facilities and regular screening services should be made available in antenatal clinics. In nursing research, the findings provide a basis for conducting further studies with larger samples and different settings to evaluate interventions aimed at improving knowledge and preventing anemia among antenatal mothers.

Limitation

- The study was confined to a small group
- The time period of the study was limited.

Conclusion

The study highlights that adverse pregnancy outcomes remain a significant public health concern and are strongly influenced by socio-demographic and economic factors. Despite national efforts, gaps in healthcare services and limited awareness among women continue to contribute to poor pregnancy outcomes. Strengthening maternal health services, improving education and awareness, and ensuring targeted interventions are essential to reduce APOs and enhance maternal and fetal well-being.

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Conflicts of interest

The author declares that no any conflict in this study.

Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors declare that generative artificial intelligence (AI) and AI-assisted technologies were used only to improve the language, grammar, and readability of the manuscript. The authors reviewed and edited the content carefully and take full responsibility for the accuracy, originality, and integrity of the final manuscript. No AI tools were used for data analysis, interpretation of results, or generation of scientific conclusions.

Ethics Approval

Permission obtained from concerned authorities. Informed consent taken from participants. Confidentiality maintained.

Data availability

The data are available and may be obtained upon reasonable request.

Abbreviation

S. No.	Abbreviation	Full Form
1	ANC	Antenatal Care
2	ANM	Auxiliary Nurse Midwife
3	BMI	Body Mass Index
4	CBC	Complete Blood Count
5	CI	Confidence Interval
6	EDHS	Ethiopia Demographic and Health Survey
7	Hb	Hemoglobin
8	IDA	Iron Deficiency Anemia
9	IFA	Iron and Folic Acid
10	NFHS	National Family Health Survey
11	OPD	Outpatient Department
12	P.A.	P.A. Kinser
13	SD	Standard Deviation
14	SPSS	Statistical Package for the Social Sciences
15	WHO	World Health Organization

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